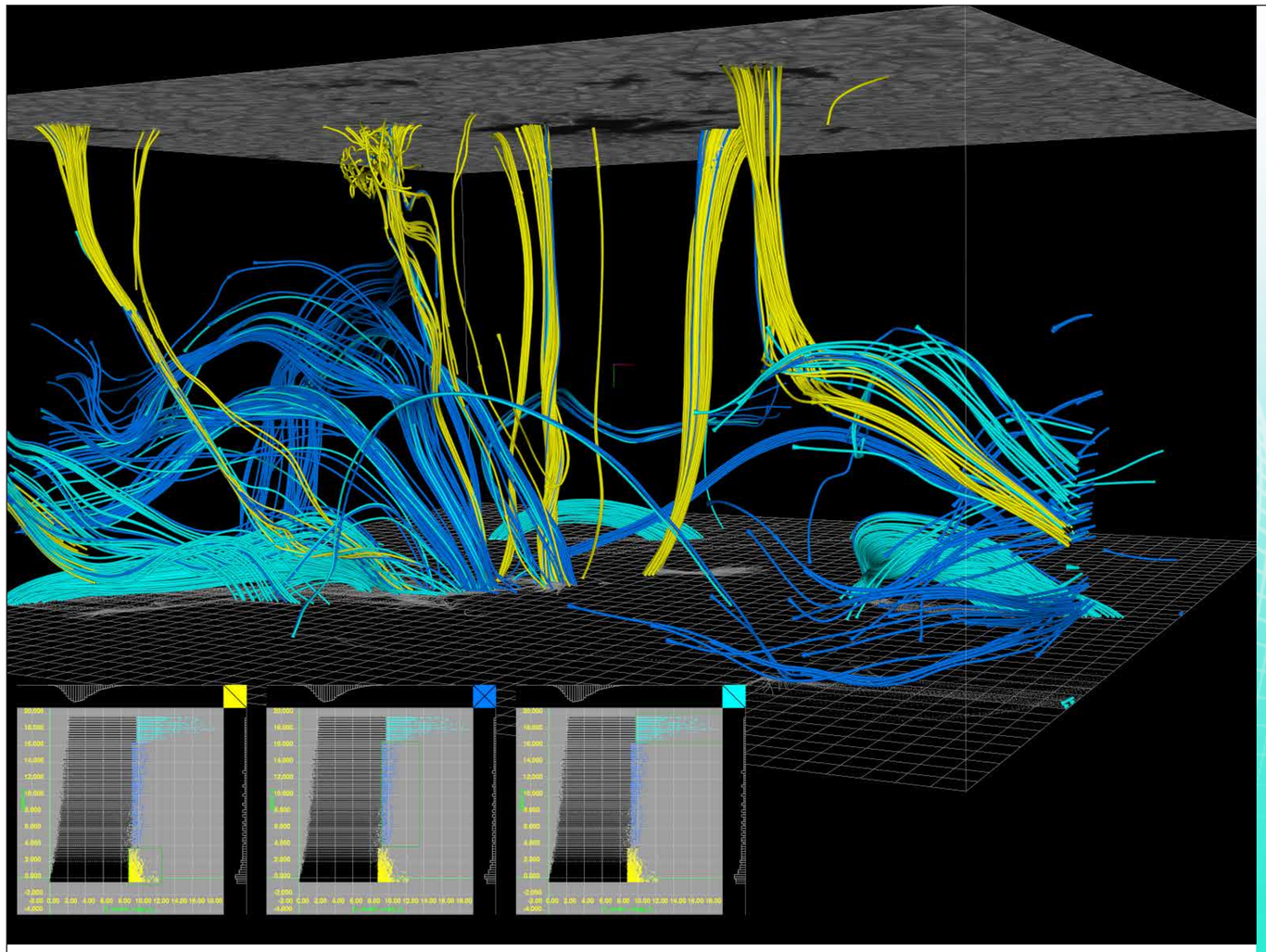
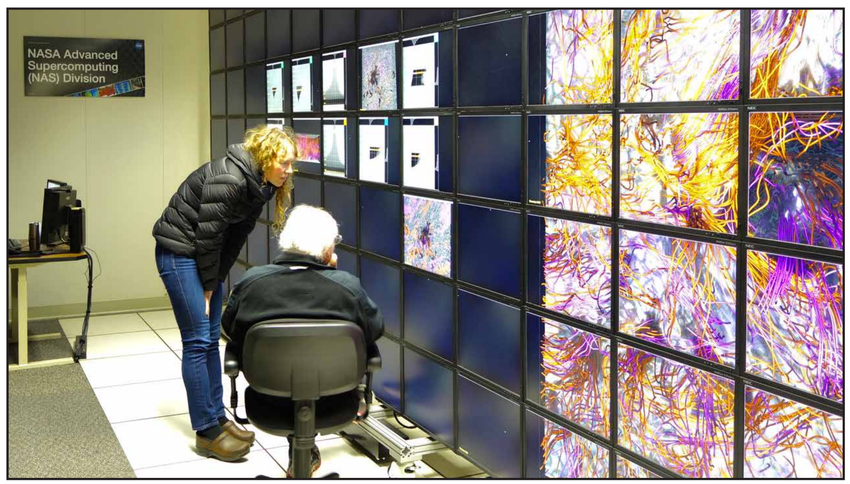


Snapshot of magnetic field lines in the solar convection zone. Convective upflows and downflows advect the magnetic field into coherent loop-like structures that can emerge through the solar surface, producing sunspots as well as occasional flares and coronal mass ejections of energetic particles and radiation. A visualization technique called "Linked Derived Spaces" supports the exploration of solar magnetic field line structures via selections within scatterplots of associated data attributes. *Nina McCurdy, University of Utah; Patrick Moran, NASA/Ames*



The "Linked Derived Spaces" visualization technique in action during a visit from solar physicist Robert Stein (Michigan State University) to the NASA Advanced Supercomputing (NAS) facility at Ames Research Center. Implemented on NAS's 128-tile hyperwall visualization system, this approach is helping researchers identify correlations across many data attributes, as well as correlations between those attributes and the emergence and evolution of magnetic field line structures. *Patrick Moran, NASA/Ames*

National Aeronautics and
Space Administration

Interactive Exploration of Solar Magnetic Field Lines

Earth's space weather is driven by magnetic activity in the Sun. Within the solar convection zone—the outer 30% of the Sun—turbulent motion of magnetic fields gives rise to sunspots and occasional bursts of extremely high-energy particles and radiation. These bursts can interact with Earth's outer atmosphere, producing auroras, disrupting radio communication, and endangering astronauts and satellites.

Magnetohydrodynamics simulations, run on NASA's Pleiades supercomputer, model the complex phenomena involved in these processes. The simulation results, coupled with advanced visualization techniques that support interactive exploration of magnetic field data, are helping to clarify the evolution of solar magnetic fields and to detect emerging magnetic features that drive the production of sunspots and solar eruptions.

Nina McCurdy, University of Utah
Patrick Moran, NASA Ames Research Center